Abstract of the Invention

A method of estimating timing of at least one of the beginning and the end of a transmitted signal segment in the presence of time delay in a signal transmission channel. Each of a sequence of signal frames is provided with a pseudo-noise (PN) m-sequences, where the PN sequences satisfy selected orthogonality and closures relations. A convolution signal is formed between a received signal and the sequence of PN segments and is subtracted from the received signal to identify the beginning and/or end of a PN segment within the received signal. PN sequences are used for timing recovery, for carrier frequency recovery, for estimation of transmission channel characteristics, for synchronization of received signal frames, and as a replacement for guard intervals in an OFDM context.